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(21)Application number : 08-041790 (71)Applicant : INCAT SYST SOFTWARE USA INC

(22)Date of filing : 28.02.1996 (72)Inventor : CAFFARELLI FABRIZIO

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(54) COMPACT DISK RECORDING DEVICE AND ITS METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a device and a method for incrementally recording data in a compact disk.

SOLUTION: A compact disk physically formatted in accordance with the specification of the ORANGE book is used, and a file to be memorized is selected in time-separating and packet-divided. Next, the packet 150 is recorded in a compatible form with the ORANGE book specification together with a link LB, run-in R1B1~4 and run-out blocks R0B1, 2 into the program area of a compact disk 20, thereby linking the incrementally recorded packets. Filing information is stored together with each file. When a selected file is

recorded, File and directory information is stored into a first memory area provided in the track of a host system or a compact disk in a high efficient form in which they are double-linked. A plurality of sections 130, 135 can be recorded into the one compact disk 20.

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CLAIMS

[Claim(s)]

[Claim 1] Lead-in groove area, the program area which has two or more sectors, And data are set to a compact disk including lead-out area at the approach of carrying out increment record. ; at least one file which should be made to memorize -- additional -- choosing --; -- at least one file is chosen --

**, although all the files boiled and chosen are memorized The required total storage capacity It divides into two or more data blocks. checking --; -- sufficient memory capacity to memorize each selected file to said program area of said compact disk is obtained -- checking --; -- each selected file being made into a single data block, or at least one packet containing said at least one data block -- creating --; -- the link block of correspondence by said at least one packet -- At least one run in block, at least one data block, And if few The location of each selection file which the 1st storage area is made to memorize the information which records on said program area together with the run out block of one **, and identifies the location of each selected file in the; aforementioned program area, and has already been recorded on the; aforementioned program area The compact disk record approach characterized by consisting of the step which disregards all of the link block of correspondence, a run in block, and a run out block, and records the information to identify on the 2nd storage area of said program area in postscript.

[Claim 2] The approach according to claim 1 characterized by including the step which records the link information over the record location of a file where at least one others were chosen together with each selected file.

[Claim 3] The approach according to claim 1 that the lead-in groove, the program, and lead-out area of said compact disk are characterized by taking a format compatible with Orange book specification.

[Claim 4] The approach according to claim 1 characterized by what is recorded in a format compatible with an Orange book specification since the packet by which increment record was carried out in said at least one packet is linked.

[Claim 5] The approach according to claim 1 characterized by each packet including at least one perfect selection file.

[Claim 6] The approach according to claim 1 that said information which identifies the location of each selection file which is memorized by said 2nd storage area and has already been recorded on said program area is characterized by taking a format compatible with ISO9660.

[Claim 7] The approach according to claim 1 that said information which

identifies the location of each selection file which is memorized in said 2nd storage region and has already been recorded on said program field is characterized by taking a format compatible with ECMA168.

[Claim 8] The approach according to claim 1 characterized by recording said at least one packet on said program area as the beginning of each file starts from a sector boundary.

[Claim 9] The approach according to claim 1 characterized by said at least one packet containing the data block of the adjustable number.

[Claim 10] The approach according to claim 1 characterized by locating said 1st storage area in a host computer.

[Claim 11] The approach according to claim 1 characterized by locating said 1st storage area on a compact disk.

[Claim 12] The approach according to claim 1 characterized by said data area including two or more trucks.

[Claim 13] The approach according to claim 12 characterized by said 2nd storage area including the 1st truck of said multiple tracks.

[Claim 14] The approach according to claim 12 characterized by said 1st storage area including the 2nd truck of said multiple tracks.

[Claim 15] said approach -- loop **** -- the approach according to claim 1 characterized by creating two or more sessions on the same compact disk by things.

[Claim 16] The approach according to claim 1 characterized by including the step to which the step which chooses at least one file creates a file.

[Claim 17] Lead-in groove area, the program area which has two or more sectors, And in order to store data in a compact disk including lead-out area in; postscript in the equipment for carrying out increment record A means to choose at least one file; although all the files chosen whenever it chose at least one file are memorized A means to check the required total memory capacity; although all the files chosen as said program field of said compact disk are memorized The means for checking that sufficient memory capacity is obtained; Make each selected file into a single data block, or it divides into two or more data blocks. A means to constitute at least one packet containing said at least one data block; The link block of correspondence in the program

area of said compact disk, Said at least one packet is received together with at least one run in block and at least one run out block. The compact disk recorder to record; the location of at least one selection file where said compact disk recorder is recorded on said program area whenever said at least one selection file is recorded on said program area To the 2nd storage area of said program area, the information which identifies the location of each selection file where said compact disk recorder is already recorded on said program area A means to make the 1st storage area memorize the information to identify is included.; The link block of correspondence, The compact disk recording device characterized by including a means to disregard all of a run in block and a run out block, and to record in postscript.

[Claim 18] Equipment according to claim 17 characterized by including a means to record on said program area with each file which has a link information over the record location of other at least one selection file in said program area chosen.

[Claim 19] Equipment according to claim 17 with which the lead-in groove, program, and lead-out field of said compact disk are characterized by taking a format compatible with Orange book specification.

[Claim 20] Equipment according to claim 17 characterized by recording said at least one packet in a format compatible with an Orange book specification since the packet by which increment record is carried out is linked.

[Claim 21] Equipment according to claim 17 characterized by each packet including at least one perfect selection file.

[Claim 22] Equipment according to claim 17 with which said information which identifies the location of each selection file which is memorized by said 2nd storage area and has already been recorded on said program area is characterized by taking a format compatible with ISO9660.

[Claim 23] Equipment according to claim 17 with which said information which identifies the location of each selection file which is memorized by said 2nd storage area and has already been recorded on said program field is characterized by taking a format compatible with ECMA168.

[Claim 24] Equipment according to claim 17 characterized by said compact disk recorder recording said at least one packet as the beginning of each file

is located in a sector boundary.

[Claim 25] Equipment according to claim 17 characterized by including the data block of said at least one packet or adjustable number.

[Claim 26] Equipment according to claim 17 characterized by locating said 1st storage area in said host computer.

[Claim 27] Equipment according to claim 17 characterized by locating said 1st storage area on said compact disk.

[Claim 28] Equipment according to claim 17 characterized by said data area including two or more trucks.

[Claim 29] Equipment according to claim 28 characterized by said 2nd storage area including the 1st truck of said multiple tracks.

[Claim 30] Equipment according to claim 28 characterized by said 1st storage area including the 2nd truck of said multiple tracks.

[Claim 31] Equipment according to claim 17 characterized by including a means by which each file collection on which location information is recorded on said 2nd storage area constitutes one session, and said equipment creates two or more sessions on the same compact disk.

[Claim 32] Equipment according to claim 17 characterized by said means to choose at least one file including a file creation means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the amelioration file equipment for carrying out IKUKURU mental recording (increment record) of the data to especially a compact disk with respect to the equipment and the approach of recording data on a compact disk.

[0002]

[Description of the Prior Art] Since the first compact disk prayer was

introduced around 1983, the compact disk technique is sweeping over consumer electronics and computer business. This new technique the main applications reproduced [technique] hi-fi audio information in order that people of the limited fraction might enjoy themselves, if it cut memorizes the various information from which now a type differs, and serves as a medium widely used for the extensive application which provides many people with this. For example, an audio program and a pan are provided with all from a computer program or a game in the form of a compact disk to video and a multimedia program.

[0003] However, although use of the compact disk as a means to provide an end user with the various sources of digital information progressed considerably, it has barred that it becomes a practical bulk-store means for most end users, especially a personal computer user conjointly with the technical constraint that a compact disk record technique is comparatively hard to come to hand about a compact disk technique till recently. Since the compact disk recording device (CD-R's) was very expensive, many of personal computer users were not able to obtain this as daily necessities before. However, the price recently fell even to the level which many personal computer users can incorporate easily as some their systems.

[0004] However, availability cannot but be a part of problem. Although that the CD-R technique of low cost was realized comparatively is the advance which should be welcomed, ultimate usefulness is still restricted by the personal computer user by some problems and various constraint mentioned later. A technical specification and specification have been adopted since several years also about the logical form of data, and organization also about the physical layout of the data recorded on a compact disk. Most of compact disks, disk prayers, and disk recorders had adopted the physical layout specification defined as the so-called Red (or IEC908), Yellow (or ISO/IEC10149), and an Orange book, and these [Red], Yellow, and an Orange book started publication of Sony and Philips, and quoted the contents in this application specification for reference. The logical file structure used as British Standard was ISO9660 so-called specification, this is also published widely and this was also quoted in this application specification for reference. The compact

disk prayer manufactured today according to these British Standard amounts to 50 million or more sets, and this number is presumed to be what continued increasing further.

[0005] Yellow and Red book specification set the thing which can record a lot of data on a compact disk in one continuation writing and which is made like (it is 650 megabytes of maximum to a disk for 74 minutes) as the main purposes. To the publishing business company using CD-ROMS which sets it as the main purposes to offer mass data for CD's in this case, it is useful. However, many of personal computer users store one or two data files or more in large capacity storage in increment in many steps, and it demands to be able to read for every file if needed. Although Orange book specification offers the physical format which enables increment storage of data, the logical file structure which acts within the limits of this physical specification, and enables useful increment record for a personal computer user is needed.

[0006] According to the present specification, a recordable compact disk is classified into a fixed number of blocks (or sector). The capacity of a disk is expressed with a part, a second, and a sector. Since 75 sectors are contained in 1 second, if it is a disk, for example for 74 minutes, x75 sector / second will be included by /for 333,000 sector, i.e., x during 74 minutes, 60 seconds. The real user amounts of data recordable on each sector differ according to the physical format used for record on a disk. Each sector contains 2 K bytes of data the case of the physical format currently most widely used for record of computer data, i.e., Yellow book specification. That is, according to this format, a disk can contain the data of about 650 megabytes of maximum for 74 minutes.

[0007] According to the present Orange book specification, a disk can contain two or more sessions. Each session consists of a lead-in groove field including information, such as control information used by the hardware of CD prayer, the program field where a user's data are recorded, and a lead-out field. After the data which should be recorded are recorded on a program field, a session is closed by recording a lead-in groove and a lead-out field. The lead-in groove and lead-out field of the 1st session occupy all of disk memory tooth spaces, i.e., about 13 megabytes.

[0008] According to the present Orange book and ISO9660 specification, in many cases, data are recorded on a compact disk using the so-called "Track-AT-Once" approach. By this approach, each time data is recorded on a disk and written in the physical sector which the same truck follows. This physical specification has restricted the number of trucks which can be distributed at a single or two or more sessions to 99 trucks / disk. A short pre gap precedes with each truck. In order for the existing CD-ROM prayer to read the file currently recorded, ISO9660 file structure must be recorded about the data in each truck. Even if this file structure describes the file already recorded on other trucks of the same disk, it is not necessary to have it. Moreover, before reading the file currently recorded, a session including the truck with which the file is recorded must be closed.

[0009] The specification of these existing serves as constraint remarkable for the personal computer user who wants to use CD-R as increment type large capacity storage. For example, a computer user has one or a small number of comparatively small file, and the case where hundreds of K bytes of file must be recorded slightly at the given time, even if it probably ******. In order to be able to access these files through the existing CD-ROM prayer, a user has to close a session including the truck with which these files are recorded. Therefore, in this typical scenario, it totals, or in order to be able to access hundreds of K bytes of file, 13 - 23 megabytes of session overhead is needed. In order that a user may access that data, the storage tooth space where a user loses loop more nearly false ********** becomes large about this scenario. every [moreover,] truck -- or all the ISO9660 file structures for 1 set of every trucks must be recorded on each truck in one writing. Therefore, if a user records single updating to the file already recorded and excels, ****** and all ISO9660 file structures must be written in for a new session about single track including the file which can add single updating.

[0010] The new logical file construction specification which enables an increment write-in file is European Computer Manufacturer's Association (ECMA). It is proposed. ECMA168 (or DIS13490) of the specification which ECMA proposed is extension of ISO9660 specification. This ECMA168 specification was also quoted in this application specification for reference.

[0011] The Orange book and ECMA168 specification define the physical record approach, the format, and logical file structure which make it possible to carry out increment record of the data as the compact disk in the form of the "packet" of regularity or adjustable die length. The file which is written in from a host computer and recorded on a compact disk is divided into two or more packets as a single packet, and is recorded on the continuous physical memory location. When it differs, in order to be able to carry out the increment record of the data, a link block and four run in blocks are allotted ahead of each packet, and two run out blocks are allotted back. These addition blocks are required to judge where finally record was interrupted for CD-R hardware, or where record starts next.

[0012] However, an Orange book / the ECMA168 packet record approach also has large constraint. It is one of the constraint not to suit with the existing CD-ROM prayer and device driver (or software extension) which agree on a Yellow book / ISO9660 specification and some level. Such a prayer and its device driver do not recognize the link, Laon Inn, and the run out block which may contain the recorded packet. It answers in a "read error" that such a block is encountered, and future read is closed.

[0013] A link and a run block are recognized as an attempt for avoiding the problem of this "read error", and the CD-ROM configuration which carries out skip over is proposed. However, although this solution can be performed only within the case where only the packet of fixed die length is written in, it is very difficult to perform, when writing in a variable-length packet with strange size. Moreover, this new configuration does not suit with a huge number corresponding to ISO9660 specification of existing CD-ROM prayers. These existing prayers cannot be read in the compact disk medium currently recorded by the packet method which ECMA proposed.

[0014] Whenever the directory, path, and file structure which ECMA proposed update a file or a directory, they need a lot of linking and re-linking further again. Linking and re-linking is also very complicated, therefore it is suitable only for the application the increment writing of a **** fraction is expected to be. Otherwise, structure is complicated too much, it is bulky and the tooth space and overhead which should be maintained become large too much.

[0015]
[Problem(s) to be Solved by the Invention] Therefore, implementation of the file system which enables increment record of the data to a compact disk improved so that many problems and constraint which were not able to solve a well-known system and a well-known approach might be conquered is desired. Moreover, it will become the storage means of super-large capacity by the low cost which was rich in the practicality to which a CD-R technique finally fills the bulk-store need with which a personal computer user increases continuously with canceling the above-mentioned problem and constraint.
[0016] Then, one purpose of this invention is to offer the file system and approach of having been improved which make it possible to carry out increment record of the data file at a compact disk. Other purposes of this invention are in a compact disk with the minimum effective and overhead need offering the file system and approach of making it possible to carry out increment record of the data file.
[0017] Other purposes of this invention are to offer the above-mentioned file system and approach of enabling quick access to the file by which increment record was carried out. The purpose of further others of this invention is to offer the above-mentioned file system and approach of having sufficient flexibility fitting a huge number of existing CD-ROM prayers, the CD-ROM prayer of the future [driver], and a driver configuration.
[0018] About operation, other purposes of this invention are flexible and are to offer the above-mentioned file system and approach of making data recovery easy in an error or interruption. The purpose of further others of this invention is in the thing which can use together with a personal computer system and for which the above-mentioned file system and approach with Standard C D-R's of low cost which are used together are offered comparatively.
[0019] The above of this invention and the other purposes, the advantage, and the description will become clear [to this contractor] from the epitome of invention described below, detailed explanation of a desirable example, an accompanying drawing, and a claim.
[0020]
[Means for Solving the Problem] This invention conquers substantially the

problem of a well-known compact disk file system and an approach, and constraint by offering the new file system and the record approach of enabling increment record of the data file to a compact disk, maintaining the CD-ROM prayer of a Yellow book / ISO9660 existing specification, and compatibility with a driver.

[0021] According to the time, a single or multiple files is chosen in order to make the compact disk which has a lead-in groove field, a program field, and a lead-out field in the system and approach of this invention memorize. Selection of a file can be performed also including the activity of creation. For example, it can function as the source of a file which a scanner should record. The total storage capacity required for making the file of ** memorize about the single or multiple files chosen at the specific time is checked. It is judged whether sufficient storage capacity to memorize this selected file to the program field of a compact disk is securable. A file is composed by the format of a single or two or more packets, and is recorded on the program field of a compact disk together with a link, Laon Inn, and the link information about other packets currently recorded [which are recorded and are run-out-blocked]. In this way, what is necessary is just to record the information and directory information which describe each file recorded on a host system and/or the reverse memory location of a compact disk. In this way, what is necessary is just to disregard a link, Laon Inn, and a run out block that what is necessary is just to create according to ISO9660, ECMA168, or the occasional specification of those, in order to maintain the existing CD-ROM prayer and compatibility with a driver if the file location and directory information which were recorded are required. the new section of the disk which records a lead-out field and has another lead-in groove, a program, and a lead-out field -- receiving -- this process -- loop **** -- two or more sessions can be created on the same disk by things.

[0022]

[Embodiment of the Invention] The personal computer system which can use together the desirable example of the file system of this invention to drawing 1 is illustrated. as a computer 10 -- IBM -- compatible or Apple Although a stand-alone type personal computer like a Macintosh computer is suitable, in

addition to this, you may be a workstation, a network computer, a minicomputer, or a similar information processor. As a typical configuration, a computer 10 has the memory 30 which holds a program and data temporarily, and the hard disk 35 which memorizes a file everlastingly, and said file includes the file of a program, data, application, or others. In addition, although drawing 1 has shown that it exists in the exterior of a computer 10 in the above-mentioned component, this is for making an understanding easy and these components are usually built in a computer. A computer 10 can contain the scanner 25 connected through the small computer system interface (SCSI) of a single or two or more standard serials, and juxtaposition, or other well-known interfaces and/or (not shown) other peripheral devices, for example, a printer, a floppy disk, etc.

[0023] In the desirable example of this invention, a computer 10 is connected with the Orange book specification compact disk recorder (CD-R) 15 through a standard SCSI interface. However, ATAPI or other suitable interfaces may be used. suitable CD-R's for concomitant use with this invention -- Sony, Ricoh, Yamaha, JVC, Plasmon, Philips, and Kodak etc. -- it manufactures and sells. For example, Sony is manufacturing and selling such a CD-R by the model name of CDU920S. Philips What is sold is CD-R of the model names CDD521 and CDD522. In addition, since it is not contained in the range of this invention, the detail except the configuration of CD-R15 and actuation mentioning later is omitted.

[0024] CD-R15 collaborates with 120mm diameter compact disk (CD) 20 of Yellow and Orange book specification in a desirable example. However, it cannot be overemphasized that this invention is not restricted to the physical parameter of specification [CD medium]. a computer 10 -- a criterion -- it is also connectable with the CD-ROM prayer 40 through stylish SCSI, a serial, or other suitable interfaces. Standard ISO-9660 / Yellow book specification prayer which reads ISO-9660 / Yellow book specification compact disk 45 of standard 120mm diameter as a CD-ROM prayer 40 and which is used widely now can be used. Or new style two or more session prayer which can also read two or more session CD's as a CD-ROM prayer 40 may be used. Although the computer 10 is connected also with CD-R15 and the CD-ROM

prayer 40 in the system of drawing 1 in order to give explanation of the desirable example of this invention easy, it records on CDs 20 or 45 by CD-R connected with a computer in fact [while], and reads by the CD-ROM prayer linked to the computer of another side.

[0025] The file system 55 of this invention is made to intervene between the host application program 50 and the CD-R equipment driver 60 preferably, as shown in drawing 2 . If the host application program 50 can choose the single or multiple files which should be recorded among the various programs executed by computer 10, what kind of thing is sufficient as it. As such a program, it is Microsoft. The Word trademark of a shrine, or Word of Word Perfect For example, a Perfect trademark or Microsoft trademark WindowTM File File management like Manager can be mentioned. Or it was written by the user in others as such a program, the file backup program of a proper can also be used for CD-R offered by the CD-R manufacturer.

[0026] The desirable example of a file system analyzes the file chosen by the host application program 50 for record, prepares a format, and it creates a file and a directory structure so that it may mention later in detail. The desirable file system 55 communicates the file and the file / directory structure information that the format was prepared by the compact disk recorder 15 through the well-known CD-R driver 60. In the case of a desirable example, it communicates with CD-R15 so that it may mention later in detail through the SCSI command transmitted with the standard SCSI interface 65. However, other suitable interfaces may be used.

[0027] By reading the file / directory structure currently recorded, the desirable file system 55 carries out location detection of the necessary file and composes it in the format for making the host application program 50 communicate to read the file already recorded on CD-R15. The desirable example of a file system 55 is constituted so that it can record on the compact disk which can be read by the compact disk prayer compatible with existing Yellow book / ISO9660 which collaborates with well-known Orange book specification CD-R's, for example, uses a standard driver like a well-known Microsoft trademark MSCDEX driver (or software extension). Drawing 3 , 4-(A), and 4-(B) show the well-known physical format specified to a compact

disk like CD's 20 and 45 by Yellow and the Orange book at each. As shown in drawing 3 , Yellow book specification has demarcated many fields on the physical front face of a recordable compact disk (CD-WO) 20. Only the one half of a compact disk 20 is shown in drawing 3 . The left-hand side of a compact disk 20 expresses the core of a compact disk, and right-hand side expresses the rim of a disk. A disk is around gone mostly along a spiral truck without the break which reaches at a rim from the core of a disk in the illustrated various area. Power Calibration (PCA)70 and Program Memory Area (PMA)75 occupies the location which adjoins mutually near the core of a disk. Such area is assigned so that it may be used by CD-R hardware. The short gap 80 which is not recorded separates PCA and PMA area from the lead-in groove area (LIA) 85. LIA85 includes the table showing the contents of each truck currently recorded on the disk other than control and mode information. The lead-out area (LOA) 90 of correspondence occupies the location near the rim of a disk 20. The area between LIA85 and LOA90 is a program area 95, and user data are recorded on this. The single area which may subdivide in many trucks TN1 and TN2 and --TNN if , and does not have a break is still sufficient as a program area 95. In subdividing on a truck, it prefaces the short pre gap 100 on each truck. The area containing LIA, LOA, and a program area constitutes one session (period) 105.

[0028] LIA and LOA area are reserved first. The data of the file which should be recorded, or others are classified into the block of regularity or adjustable die length. Subsequently, a block is physically recorded on the physical sector of the continuous program area which presents gestalten, such as a single or a multiple track 1, for example, TN etc. What is necessary is just to close a session by recording control, the mode, and track index information on LIA and LOA area, if all the data that should be recorded are written in a disk. Since it is indicated by the Yellow book specification and is about the parameter and the contents of PCA, PMA, LIA, LOA, a truck, and the pre gap, duplication is avoided here and detailed explanation is omitted.

[0029] Drawing 4 - The Orange book specification also defines PCA70 and PMA75 area which adjoin mutually near the core of a disk so that clearly from (A). The short gap 80 separates PCA and PMA area into a Yellow book

specification and coincidence from the 1st lead-in groove area LIA1110. The 1st lead-out area LOA1115 corresponds with LIA1. The 1st program area 120 intervenes between LIA1 and LOA1. The area which consists of LIA1, the 1st program area 120, and LOA1 constitutes the 1st session 130.

[0030] It is drawing 4 also about the 2nd session 135 which has the 2nd program area 140, the 2nd lead-in groove (LIA2), and lead-out (LOA2) area. - It was shown in (A). Drawing 4 - Although only two sessions were shown in (A), if it is less than the storage capacity of a disk, a required number of sessions can be formed. Each session occupies the field which adjoins the session of just before (assuming that it exists) and an immediately after.

[0031] Each program field can be classified into two or more trucks if needed, and has shown each of the 1st program area 120 and the 2nd program area 140 three trucks TN1, TN2, and TN3 by a diagram. The short pre gap 100 is prefaced on each truck like the case of a Yellow book specification. In order to make increment record of data easy, data are recorded in the form of a packet. For example, the data recorded on the truck TN1 of the 1st session 130 are classifiable into three packets P1, P2, and P3. It is possible similarly to classify only into two packets P1 and P2 the data recorded on the truck TN2 of the 1st session 130 etc. Each packet 150 consists of a link block LB, four run in blocks RIB 1-4, two or more data block DB1-N, and two run out blocks ROB 1-2. Before the record activity which Orange book specification CD-R's precedes ending a link, Laon Inn, and a run out block, judging the location where the next record activity starts and beginning to record the following packet, it makes it possible to synchronize with a compact disk. Since the detail of others about packet structure, a parameter, and the contents is indicated by the Orange book specification, it avoids duplication and omits explanation here. For example, when reading a recorded disk by the existing ISO9660 specification compact disk prayer using an existing driver (or software extension) like MSCDEX, ISO9660 directory, a path, and a file structure must be recorded on the 1st truck 1 of a session, i.e., TN. Since the detail of an ISO9660 logic directory, a path, and a file structure is indicated by the published specification, it omits the explanation here. However, as a general description, as shown in drawing 5 , 1 set of volume descriptors 160

containing the primary volume descriptor (PVD) 170 are contained in these structures. PVD includes the information which describes the data which consist of the concrete volume corresponding to this. PVD includes the fields 175 and 180 which show the address and size of the path table 190, respectively. PVD also includes the copy of the root directory record 185.

[0032] Each file in each directory and a directory is described by a file / directory record 200. The root directory record 185 in PVD170 is the copy of this root directory record. Each file / directory record 200 have the fields 205 and 210 which contain the address and die length of the first block of a file or a directory entry, respectively. Each record 200 has the fields 215 and 225 containing the name of the time and file, or directory where the file or the directory was recorded. Otherwise, a record 200 has the flag field 220 containing the flag 230 with which specific record directs the thing about a file, or the thing about a directory entry. Each directory record includes the record which identifies the parent directory. The file / directory record 200 is arranged by the alphabetical order, and each file in a directory continues [record of each subdirectory] further following each directory record back.

[0033] The path table 190 consists of the collection of a directory ID record. Each ID record includes the address of the directory record 200, and ID# of a parent directory and the fields 235,240 and 245 which show a directory name, respectively, if a directory is a subdirectory. The field 180 of PVD170 shows the address of the 1st directory ID record of the path table 190. That is, in ISO960 structure, chaining search of a file / the directory record 200 can be carried out, or location detection of a specific file or a specific directory record can be carried out on the direct path table 190.

[0034] In order to maintain compatibility with the existing ISO9660 compatible CD-ROM prayer, the session containing present ISO9660 file / directory structure must be closed for every record of increment change of adding, deleting updating a file, or adding or deleting a directory, a new session must be opened wide, updating must be recorded on this new session, and the whole ISO9660 file / directory structure must be anew written in this new session. Now, as already stated, when it not only takes a part with large disk memory capacity for an overhead, but much increment modification or

additions are performed especially, a specific file or the search time of a directory increases inconvenient. Moreover, the Yellow book / ISO-9660 compatible single session CD-ROM prayer covering many models is still used. These prayers cannot even perform reading two or more session CD's. This invention conquers such constraint substantially.

[0035] An ISO9660 file structure is constituted, and in order to maintain compatibility with the CD-ROM prayer which it not only records on the 1st truck of the reverse sense of each session, but follows ISO9660 specification of a low (for example, software extension like MSCDEX is included), others and some conventions may have to be followed. Such a prayer and a driver do not recognize the link, Laon Inn, and the run out block which encounter, but answer a letter in an error. However, CD's by which increment record is carried out in an Orange book format can maintain compatibility with such a prayer and a driver, if the format of a recorder file is set up including the file of a single or plurality with each perfect packet so that the file of die length of one or more packets may not exist. If this convention is followed, the link, Laon Inn, and the run ATOU block with which the data streams which constitute the contents of the file are scattered do not appear. Therefore, the read head of a CD-ROM prayer does not encounter these blocks. Since it is turned to the beginning logic book address of the packet which contains the start of a file first when reading a file, a link or a run in block is not encountered. Read is made to end, before the read head encounters an end of file (EOF) and encounters a run out block at the same time read is completed.

[0036] The logical file / directory structure proposed as ECMA168 are one of those are replaced with ISO9660 logical file / directory structure. Since this file / directory structure that is extension of ISO9660 structure are published widely, it omits explanation here. However, as a general description, an ECMA proposal is ISO9660 so that clearly from drawing 6 . The same volume descriptor set (VDS) 250 as VDS160 is included. VDS250 contains a descriptor (PVD's) 255 for a single or two or more primary volumes. PVD255 is the same as that of PVD170 of ISO9660. One big difference is that the direct pointer to a root directory record, or a file / directory record is not

included. PVD255 contains the pointer to the path table 260 similar to the path table 190 of ISO9660. The path table 260 contains the pointer to the collection of the same file as ISO9660 file / directory record 200, and the directory record 265. Unlike the file / directory structure of ISO9660, in case an increment change is made to a file or a directory in an ECMA proposal, it is not necessary to rewrite the whole file / directory structure. By ECMA168 proposal, new VDS270 is created by new PVD275. New PVD275 contains the pointer to the new path table 280. The new path table 280 contains the pointer to the file / directory record 265 which is not changed, and the file / directory record 285 updated or it was new. The new path table 280 contains the pointer to Precedence VDS. The path table of precedence also contains the pointer to last VDS etc.

[0037] although the file / directory structure which ECMA168 proposes are superior to ISO9660 about the increment recorder file to be sure -- especially -- a file -- and -- or since it becomes linking continues broadly and complicated when making much increment change to a directory comparatively, it is troublesome, and it is inefficient. The file system of this invention can maintain compatibility with the CD-ROM prayer and driver which are based on ISO9660 specification on all level. And the non-invented file system is flexible by the time the CD-ROM prayer and driver which adopt not only the future CD-ROM prayer and driver compatible with the ISO9660 present specification or that are not compatible but ECMA168 specification can maintain compatibility. To coincidence, the file system of this invention conquers substantially the trouble of the conventional logical file / directory structure specification, and constraint.

[0038] In the desirable embodiment shown in drawing 7 , the 1st truck 300 of the program area of each session is reserved as ISO9660, ECMA168, or other files/objects for directory structures. It is not necessary to record such a structure on a truck 300, and a truck 300 is reserved to record such a structure for compatibility with ISO, ECMA, or other necessary specification. The desirable file system of this invention enables perfect access to an increment recorder file and a directory regardless of the existence of compatibility with ISO and/or ECMA.

[0039] It is the 1st File to follow the 1st reserved truck 300. Information It is Area (file information area)305. The 1st data area 310 of correspondence follows this preferably following this 1st file information area 305. The 2nd file information area 315 and a data area 320 may be made to follow the 1st data area, and the area pair of the addition corresponding to such area may be further arranged if needed following this. As for each file information area and each data area, it is desirable to make the area of both sides follow. In the desirable example, it records on a data area 310,320 etc. in the format which mentions a user's file data later. The file and directory structure which describe the file and directory entry which are recorded on each data area are also recorded on the file information area 305,315 of correspondence etc. in the following format.

[0040] In the desirable example, each file information area consists of the reserved truck which has the storage tooth space of the specified quantity. The amounts of the storage tooth space reserved as file information area differ according to an application. However, in order to double with Orange book specification, seven blocks need the block of the eight minimum, or a sector for the block of the one minimum, a link, Laon Inn, and runout information to storage of -, i.e., a file, and directory structure at the reason mentioned later.

[0041] As for each data area, it is desirable to include a truck. However, the storage amount of space for a data area truck may not necessarily be fixed. That is, in the desirable example, a file and a directory entry are recorded on a data area until the correspondence file information area of a data area fills. A data area truck is bolted at this time. Subsequently, a truck new as next file information area is reserved, and a truck new as a following data area is opened wide. An additional file and an additional directory entry are further recordable on an open new data area until the reserved file information area fills again.

[0042] As for the file and directory entry which are recorded on a data area, it is desirable to record as the single which has the format shown in drawing 8 , or two or more packets. As for each packet 325, it is desirable that the single or the multiple-files data block 345 which consists of the contents of at least

one packet link header 330, the directory field 335, a 1-N file / directory record 340 and a single, or multiple files is included.

[0043] The packet link header 330 forms the duplex chain which connects all the packets 325 currently recorded on the data area. That is, as for each packet in a data area, it is desirable to be linked with the packet of just before and an immediately after. The 1st packet in a data area is preferably linked with the packet of the last in a precedence data area, and the packet of the last in a data area is preferably linked with the 1st packet in a consecutiveness data area. This chain makes it possible to constitute or reconfigurate perfect file/directory structure only by carrying out sequential access to each packet in a chain if needed. This is the important description of this invention. It is not necessary to record the file/directory structure corresponding to the packet or packet set memorized on file information area directly as one of the reason of the. In addition, whenever it records a file / directory structure set on file information area, 7 blocks of a link, Laon Inn, and runout information must also be recorded. The cache of the file/the directory information corresponding to the packet which follows, for example, is recorded on the computer memory or the hard disk must be carried out a buffer or often until the single of such information or two or more blocks are accumulated. This desirable approach controls the storage amount of space of the file information area wasted by the overhead as compared with a file/directory information to the minimum. When it is lost before the file/directory information by which the cache was carried out were recorded, or spoiled, it can reconfigurate from the list which coordinates this. Moreover, when interruption and an error occur in a packet record process, it can check whether which packet has made it record correctly at the end only by carrying out the chain of the packet to the last record packet, and record can be continued from the following chain packet.

[0044] Therefore, as for the packet link header 330, it is desirable to have the 2nd field 355 including the 1st field 350 which includes the begin-block absolute address of a precedence packet at least, and the begin-block absolute address of a consecutiveness packet. As for the packet link header 330, it is desirable to also have the 3rd field 360 containing the number of the

file further included in a packet and directory entries.

[0045] When a packet includes directory entry information, as for the directory field 335, it is desirable to enable temporary storage of information required to constitute or reconfigurate directory structure. That is, as for this field, it is desirable that discernment of a directory name, parents, and a partial directory and a directory identification number are included at least.

[0046] a file / directory record field 340 is included in a packet -- having -- each file -- and/or, the file / directory record for each directory entry are included noting that it exists. Therefore, the number of the file / directory records in the field 340 is in agreement with the number of entries specified all over the packet link header field 330.

[0047] As for each file / directory record, it is desirable to have the format shown in drawing 10 . In a desirable format, each file / directory record are records of adjustable die length. As for the 1st element of record, it is desirable that it is the field 420 which shows the die length of record. He is Apple about this invention. What is necessary is just to constitute so that record may also include the file creator 425, a file type 430, and the finder flag 435 field in using together with a shrine personal computer. These fields are Apple at the purpose which identifies a file or is searched. The Macintosh operating system has adopted. What is necessary is to delete these fields at the time of un-using it, or just to set to zero. In order to show the time of a file, it is desirable to form the field 440. Expressing for example, with a DOS format is appropriate for the time of a file, and including the date and time of creation of a file, when corrected, it includes the time of the newest modification date.

[0048] As for the field 445, it is desirable that it is the attribute field which identifies the file of correspondence or the attribute of a directory. As for the existence or nonexistence of each attribute, it is desirable to be shown according to the condition of the flag bit of correspondence. The attribute from which a large number differ if needed can be used. However, in the desirable example of this invention, the following attribute flag is used at least. As for the attribute flag 450, a file or a directory shows a read only attribute or a read / write attribute. The attribute flag 455 shows whether the file or the directory

is hidden. As for the attribute flag 460, a file shows a system or a user file. The attribute flag 465 shows whether the packet data corresponding to the present file / directory record are a volume label. The attribute flag 470 shows whether the packet data corresponding to the present file / directory record are a file or a directory entry. The attribute flag 475 shows the archive (document) file similar to the convention used in DOS. What is necessary is just to reserve the attribute flags 480 and 505 etc., if in order to add other attributes later. The attribute flag 485 shows whether the file data corresponding to the present file / directory record covers two or more packets, and is continued. The description of a desirable example is to be able to record the packets and the very long files of adjustable die length also including two or more packet write-in operation on a link, Laon Inn, and a run out block, without making file data scattered so that it may mention later in detail. This capacity makes it possible to record a long file, maintaining the CD-ROM prayer of existing as which this invention has adopted the level 1 of ISO9660 specification, and compatibility with a driver. The attribute flag 490 shows that the file or directory entry corresponding to the present file / directory record was deleted. It is shown that the file corresponding to the present file / directory record moved the attribute flag 495 to other directories. In the attribute flag 500, the flag 500 corresponding to the present file / directory record shows that the file corresponding to the present file / directory record is the updating version of the file recorded before.

[0049] It is desirable that it is the compression type field 510 which shows whether the packet data corresponding to the present file / directory record are compressed by the attribute field 445, and shows the type of the compression currently used supposing it has compressed. As for the fields 515 and 520, it is desirable incompressible and that compression die length is included [of the file corresponding to the present record]. As for the field 525, it is desirable to include a correspondence file or the initiation sector absolute address of a directory. As for the field 530, it is desirable that the figure volume or Session ID which shows the volume or session when the file or directory of correspondence is recorded is included. As for the field 535, it is desirable to include the figure ID about the file or directory corresponding to a

file / directory record, and, as for the field 54, it is desirable to include the figure ID about the parent directory of the file corresponding to the present file / directory record or a directory. As for the field 545, it is desirable that the die length of the file of correspondence or the name of a directory is included, and, as for the field 550, it is desirable that a file or the alphabetic character name of a directory is included. It is desirable to reserve and place the field 555.

[0050] As for the file / directory descriptive data recorded on file information area as well as the file and directory entry data which are recorded on a data area, it is desirable to be recorded on a duplex chained list in a packet format. Therefore, each packet in file information area is linked with precedence and a consecutiveness packet. As for the last packet in file information area, it is desirable to be linked with the 1st packet of the next file information area, and its same is said of the reverse. If this format is adopted, the search time taken for a file system to carry out location detection and to access the file and directory which pass quickly and efficiently the file and directory structure by which increment record was carried out, and are recorded on a single or two or more data area trucks can be contracted to the minimum.

[0051] Drawing 9 shows the desirable packet format of file information area data. Each packet 370 has almost the same packet link header 330 and format which were shown in drawing 8 as the 1st field, and it is desirable that the purpose also has the packet link header 330 and the same packet link header 375. The packet link header 375 includes each precedence in the same file information area, and the begin-block absolute address of a consecutiveness packet for the 1st and the last packet as an exception. It is desirable that the initiation block address of the 1st packet in the next file information area is included noting that the packet link header 375 of the 1st packet exists, and the packet link header of the last packet exists including the initiation block address of the last packet in precedence file information area. As for a packet 370, it is desirable to also have the field 385 including the perfect copy of the file / directory record 1-N about each file and/or directory entry which are contained in the correspondence packet currently recorded on the directory structure field 380 and the data area of correspondence.

[0052] As for the directory structure field 380, it is desirable that the subset of the information included in a file / directory record field 385 is included. As for an information subset, it is desirable to choose so that a file system can check the relation between a directory, a subdirectory, and a file quickly. Thereby, a file system answers a directory list command etc., sets a file and a directory in order quickly, and even if it does not carry out the chain of a file / the directory record, it can access a file and a directory quickly. That is, the information on others about file contents -- whether there is any paddle which only basic information required to carry out location detection and set a directory and a file in order is included, for example, is compressed -- is excepted. It is desirable to assign the ID number of a proper to each directory, a subdirectory, and a file according to the sequence in a directory chain. For example, in a root directory, it is ID. In the 1st subdirectory under No.1 and a root directory, it is ID. In No.2 and the last subdirectory, it is ID. In the 1st file under No.N and a directory, it is ID. No.Nt1 is assigned, respectively. Allocation and all files follow this in an ID number continuous to all the subdirectories in each directory. A continuous ID number is similarly assigned to the subsubdirectory in each subdirectory, and a file follows this.

[0053] The directory structure field 380 contains the entry 388 about each parent directory preferably classified according to a parent directory ID number. That is, as for each entry, it is desirable that a parent directory ID number is included as the 1st subfield 390. The next subfield 395 contains the number of entries in a parent directory, i.e., a subdirectory, and the number of files preferably. The next subfield 400 contains the 1st file in a parent directory, or the file / directory ID number of a subdirectory preferably. The next subfield 405 includes the offset address within the packet 370 of perfect file / directory record about the file or subdirectory preferably identified in a subfield 400. As for the next subfield 410, it is desirable to include the copy of the attribute field about said file or directory entry. An attribute flag can be used as a means to judge the entry included by the directory listing. For example, it can be checked whether the file was deleted by referring to the various flags in the attribute field, it was updated, or it has been moved. Subfields 400,405 and 410 are [each subdirectory in a parent directory, and] loop food **** for every

file.

[0054] Although the logical data, and the file/directory structure which constitutes the important section of the file system of this invention was explained above in accordance with the desirable example, a desirable mode of operation is explained along with drawing 11 -15 here. As shown in drawing 12 and drawing 13 , in order to record the file as which a single or plurality was chosen, a file system calculates the total storage capacity required to record the file first these-chosen in step 575. In this step, a file system accumulates the size of a file per cutting tool from the directory information for example, on a hard disk 35. In addition, the file system of this invention cannot change [compression and / whether it is incompressible and], but can accumulate a file size. Moreover, based on the packet size currently used, a file system also takes into consideration storage capacity required for overheads (general), such as packet linking besides the link which Orange book specification requires, Laon Inn, and a run out block.

[0055] Subsequently, in step 580, a file system judges whether CD which should be recorded is already initialized. A file system sends a SCSI command so that PMA may be read to CD-R. Supposing the disk is already initialized, PMA includes the information which shows a truck 1 noting that it is reserved at the present session. if not initialized -- step 582 -- setting -- a file system -- in ISO, or the ECMA file / directory structure area 300, the 2nd truck is initialized in the 1st file information area 305, and the 3rd opening truck is initialized for the 1st truck of the present session at the 1st data area 310, respectively. A file system progresses to step 585 here.

[0056] It sets to step 585 and a file system calculates the remaining memory capacity of CD, i.e., the remaining memory capacity of the present data area. This count is standard SCSI to CD-R15. READ It is desirable to carry out by making the recordable address and the remaining storage capacity which can use a CAPACITY command for a degree from delivery and CD-R15 answer a letter. An available capacity of CD is measured with need capacity, taking into consideration that a file system must reserve sufficient capacity to record required lead-out area on a disk in step 585. If sufficient capacity for making all the selected files memorize does not exist on CD, the file system is set to

step 605 and can make either of the suitable operations of shoes start. For example, a file system can make a suitable error message able to start, and can stop actuation. Or file selection is interrupted to a user, and if it changes to CD which has a required available capacity or is not yet compressed, a message will be sent so that a file may be compressed.

[0057] If there is sufficient capacity for CD, in step 615, a file system will form into a packet format the file which should be recorded. In this step, a file is divided into a data block according to the block-size specification of an Orange book, and is included in the data block field 345 of a single or two or more packets in a well-known procedure. It is level 1. ISO9660 If compatibility with a CD-ROM prayer and a driver is required, each packet divides a file so that a file may not straddle two or more packets including a single or two or more full files. Moreover, if compatibility with ISO9660 is required, each is a block, namely, a file will be blocked so that it may start in a sector boundary. However, even when these can respond also to the file over a single or two or more packets easily and have no ISO9660 compatibility, this invention which can operate to satisfaction is not a requirement for a file system. The size of a packet may be fixed or adjustable is sufficient as it. The file system of this invention can respond to all easily. If a packet size is fixed, the number of packets required for the given size of the file which should be recorded by using a well-known optimization technique can be stopped to the minimum. There is size of many factors which should be taken into consideration about the decision of a packet size, for example, the output buffer of a host system, the size of a file which should be recorded, the number, and a CD-R input buffer etc. It comes out by choosing the size of a packet according to these factors to raise the rate and efficiency of a record process to the maximum. However, in many cases, it is desirable to make a packet size equal to the size of a CD-R buffer so that a buffer underrunning error may not occur.

[0058] Similarly in step 615, a file system constitutes the packet link header 330, the directory field 335, and the file / directory record field 340 for every packet. the number of data blocks, the number of a file / directory records, size, etc. which boiled the file system, respectively and were assigned when a packet was constituted -- therefore, the overall size of each packet is known.

If the size of each packet, the address which can record the degree from CD-R, Orange book conditions, and the format of a packet are taken into consideration, it is easy for a file system to ask for the address of the precedence which should be included in the packet link header field 375, and a consecutiveness packet. for example, the beginning address of the 1st packet -- beginning address + packet size [of the present packet] + -- it is a required run out block. It can ask for the beginning address of each packet which follows similarly. What is necessary is just to insert in the field 350 for each consecutive packet, since the beginning address of a precedence packet has already become clear.

[0059] When an error occurs during the packet writing to CD-R, as for a file system, it is desirable to use a link information for recovery. For example, it can ask for the beginning address of a last record data packet by reading a record packet train and progressing until the packet recorded completely [the last] is identified. What is necessary is just to resume writing from this time. Or you may also include a special signature code in the subfield 357 of the field 330. In that case, a block is read one by one and it should just progress until it begins from the next record possible address and this signature is recognized (i.e., until it is directed to a file system that it is the recordable last packet).

[0060] Directory field information, and a file / directory record can be filled in from the directory information and the file attribute which are included in the hard disk 35 of the host computer system 10 about the file and/or directory which were chosen, for example. If a user enables it to offer the addition or the alternative information about a selection file, if needed, it can supplement with the above-mentioned information and record, or can change. A file system begins other information in a file / directory record 340, for example, a file, the beginning sector address of a directory entry, etc. from the next recordable address, and it is calculated a block required for a link and a run in block, the packet link header 330, Derek TORIFIRUDO 335, and the file / directory record 340, and by taking into consideration the sequence and size of a file in the data block field 345 of each packet further.

[0061] In step 625, a file system builds the file information area packet 370

containing the file / directory structure of the file/directory entry which should be recorded by performing same count. A file system calculates each putt for the packet link header 378 and each precedence, and the beginning address of a consecutiveness packet by beginning from the next recordable address in the reserved code track which is obtained from CD-R, and completing the above-mentioned procedure. A file / directory record only copies the file / directory record 340 from the data area packet of correspondence. About the directory structure field 380, it asks, for example from the directory of the hard disk 35 of a host computer 10. Or based on many relation supplied by the user, a file system assigns a directory and a file ID number to each parent directory, a subdirectory, and a file. The offset address field 405 for every file / directory record in a packet is called for with the overall size of the file / directory record preceded with a file / directory ID number, and specific record. The attribute field 410 is copied from the attribute field from the file / directory record of correspondence.

[0062] A file system writes a file data packet in CD-R one by one in step 635, after completing the configuration of a file / directory structure packet which should be recorded on the file data packet and the present file information area which should be recorded on the present data area. What is necessary is just to use either or the both sides of two desirable examples of a write-in routine which shows drawing 14 and 15 according to the size of a file which should be written in, corresponding to whether the packet of fixed die length is used, or the packet of adjustable die length is used.

[0063] Each packet write-in routine is the criterion SCSI which is illustrated to drawing 11 and drawing 12 . A WRITE command is used. In addition, SCSI shown in drawing 11 and drawing 12 Although a WRITE command is a 6-byte format, a well-known 10-byte format may be used. Moreover, in the example of illustration, a control byte's 5 high order bits 7 and 6 are used for specifying a packet mode code. SCSI specification reserves these bits as an object for vendors, and this invention can also record [by using this] long file writing and a deer on CD-R in the form of a single packet according to ISO9660 specification if needed in the format of many packets by much WRITE commands.

[0064] A packet mode 00 specifies the standard SCSI write-in command which CD-R is ordered so that the perfect packet by which the frame was carried out with a link, Laon Inn, and a run out block may be recorded. In addition, since the control firmware of CD-R's of standard Orange book specification controls CD-R record hardware automatically and Rink Laon Inn or a run out block is made to write in, it is necessary to carry out no file systems about the writing of said block on the occasion of the writing of a packet.

[0065] CD-R is ordered a packet mode 01 so that a part for packet part I to which a run in block and a run out block do not exist in a tail may be recorded. CD-R is ordered a packet mode 10 so that data without Laon Inn or a run out block may be recorded, and it orders CD-R a packet mode 11 so that the data accompanying the rear for a run out block may be recorded. Therefore, by using a WRITE command in order of packet modes 01, 10, and 11, moreover, a long file can be shown as recorded as writing, and the size of a host or a CD-R buffer or (in order to avoid a buffer under-run condition) a long packet single regardless of other consideration.

[0066] In order to perform the modes 01, 10, and 11, it is not necessary to add a hardware change to standard Orange book specification CD-R. What is necessary is just to recognize these modes, to control record hardware, and to add easy modification for a control firmware so that Rink, Laon Inn, and a run out block may be made to record as mentioned above. For this contractor of a CD-R technique, this easy modification is within the limits of common sense, therefore omits that explanation here. By the write-in routine shown in suitable drawing 14 to use together with the fixed packet of comparatively small size, a file system sets to step 680, and it is SCSI in the mode 00. A WRITE command is emitted. SCSI The die length (cutting tool) of the 1st packet which the WRITE command started in cutting tools 2 and 3, and was beforehand calculated by the file system in this address including LBA (logic block address), and the packet in the cutting tool 4 calculated beforehand similarly is written in. In step 685, a file system transmits the 1st packet to CD-R, and as CD-R begins from predetermined LBA, it records this on CD. A process is completed, if a file system confirms whether the packet which

should be written in remains and does not remain it in step 690. Supposing it remains, a process is loop food **** until a driver emits another SCSI command and all packets are written in.

[0067] Drawing 15 shows the 2nd useful write-in routine to the file which must be written in the long file more than CD-R buffer size by another reason useful at CD-R using two or more packets. Level 1 In order to maintain compatibility with the CD-ROM prayer and driver which have adopted ISO9660, by this routine, CD-R records a file as if it was contained in the single packet. By this routine, a file system emits a SCSI write-in command by the packet mode 01 in step 700. LBA and the transfer die-length field of this command are calculated the same with having described the packet mode 00 command. In step 705, a driver transmits the 1st packet to CD-R. According to this, CD-R records the data in the packet which starts in regular beginning LBA as one link block, four run in blocks, and Orange blocks have specified. However, CD-R does not record a run out block. Subsequently, in step 710, by the packet mode 10, a file system emits another SCSIWRITE command and transmits the 2nd packet of data to CD-R in step 715. Packet mode 10 Answering a WRITE command, CD-R records the packet in regular (it is assumed that it is located immediately after the last LBA of a precedence packet) beginning LBA. However, Rink, Laon Inn, or a run out block is not recorded. In step 720, a file system confirms whether the packet of the consecutiveness which should be written in remains. Supposing it remains, a packet mode 10 write-in process is loop food **** until all are written in. Setting to step 725, if all the remaining packets are written in, a file system is Last SCSI at a packet mode 11. A WRITE command is emitted. In step 730, a file system transmits the last packet to CD-R. By this write-in routine, it is assumed that the last packet is surely written in by the packet mode 11, and a run out block required for compatibility with an Orange book runs it after the recorded packet data. Thus, by writing in, it is recorded in the form of a long packet with the single long file written in CD-R by two or more packets, therefore compatibility with ISO9660 specification can be maintained. In addition, although the routine of drawing 15 contains the single or two or more continuation packets which are written in by the packet mode 10, at least two

packets which should be written in can use the same routine. In that case, the 1st packet is written in by the packet mode 01, and the 2nd packet is written in by the packet mode 11. The putt mode 10 is not used.

[0068] In the continuation packet write-in routine example shown in drawing 15 , it can be determined how many packets a file system writes in how among continuation packets. For example, each divides a long file into the packet of the same size as the input buffer of CD-R. If ten packets were formed as a result of division, the 1st packet will be written in by the packet mode 10, and last, i.e., the 10th packet, will be written in by the packet mode 11.

[0069] With reference to drawing 12 and drawing 13 , it explains again. When all the packets including the selected file are written in and recorded on CD-R, a file system is a cache about the packet which contains the file / directory structure about the file and directory entry which were just recorded in step 640, and sufficient tooth space to write in with the packet containing the file / directory structure which is not yet recorded confirms whether remain in the present file information area. If it remains, a file system tends to write the present file / directory structure in a cache in step 645. In step 650, if a cache becomes ****** in the writing to a cache, in step 655, the present file structure and the structure in a cache are transmitted to CD-R, and are recorded on the present file information area. The routine described in relation to drawing 14 and 15 is suitable to write a file / directory structure packet in CD-R.

[0070] However, when it becomes clear that the tooth space required to write in the contents of the cache, and the present file / directory structure in step 640 does not remain in the present file information area, a file / directory structure packet is written in file information area from a cache, maintaining linking between packets in step 660, as the file system was mentioned above. Subsequently, in step 665, a file system closes the truck of the present data area, reserves a truck new as next file information area in step 670, and opens a new data area truck in step 675. Subsequently, a file system writes the present file / directory structure packets including Rink with the last packet in return and precedence file information area in step 645 to a cache. This completes a selection file record process.

[0071] As another embodiment, a file system can also judge whether a file / directory structure should be recorded on file information area at a predetermined time interval based on the condition of a cache. In that case, a file system will record the contents of a cache on the present file information area at the predetermined interval which is not related to the condition of a cache. For example, a file system will be called so that the contents of a cache may be recorded on file information area every day.

[0072] A user can choose the file which should place time amount and should be recorded one after another. Whenever an addition file is chosen, the process shown in drawing 12 and drawing 13 with a file system is performed. Moreover, a user can place time amount and can do addition of a directory, deletion or deletion of a file, migration, or an activity like updating one after another. The file system of this invention enables such an activity. Answering an addition or deletion command of a directory, a file system constitutes the packet which should be recorded on the data packet and the present information area which should be recorded on the present data area. These packets are constituted as stated along with drawing 8 -10, and they include the suitable attribute field which shows whether it deletes whether directory record is added. The same is said of deletion or migration of a file, and a file system constitutes the packet which should be recorded on data and file information area as shown in drawing 8 -10. These packets include the attribute field which shows the condition of a file. Also in which scenario, a file system writes a packet in data and file information area in the same mode as having stated in relation to drawing 12 -15.

[0073] The file system of this invention enables a user to read a recorder file from a part or CD [finishing / record / all] at any time using standard Orange book specification CD-R. For reading a record packet, it is Criterion SCSI. The file and directory information on which a process desirable [using a READ command] and almost reverse is performed by the file system, and is recorded have the packet format solved, and are reconfigurated.

[0074] If a user wants to read a part or CD [finishing / record / all] using the CD-ROM prayer and driver of ISO9660 specification, a disk can be made compatible only by closing the present session. In the desirable example of a

file system, if the present session is closed, a file system will read a file / directory structure in the file information area included at the present session, and will re-record the same information on the reverse truck 1 of a session in a format compatible with ISO9660. A file system can also re-record a file / directory structure information on the 1st reverse truck in ECMA168 or other suitable formats if needed. Or it is also possible to constitute this process again so that it may not be carried out at the same time it closes the present session, but a trigger may be carried out by the command from a user.

[0075] if sufficient capacity for CD remains also after closing the present session if and -- a user -- a file system -- using -- a new session -- opening -- the above-mentioned mode-of-operation whole -- loop **** -- things are made.

Although the desirable example of this invention was explained above, it can carry out in various forms, without deviating from the thought of invention, and various modification can be added to the details of a desirable example. Therefore, the explanation which met the accompanying drawing and the drawing does not restrict the range of this invention which does not pass for the means which clarifies the contents of this invention, but is limited by only the claim.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram which illustrates the personal computer system incorporating the desirable example of this invention.

[Drawing 2] It is the block diagram which shows the functional relationship between the components of the desirable example of this invention.

[Drawing 3] It is the simplified schematic showing the physical layout specification of the Yellow book about a compact disk.

[Drawing 4] (A) is the simplified schematic showing the physical layout specification of the Orange book about a compact disk, and (B) is the

simplified schematic showing the packet format for increment record of the data in an Orange book specification.

[Drawing 5] It is the simplified schematic showing the ISO9660 logical file / directory structure basic specification about a compact disk.

[Drawing 6] It is the simplified schematic showing the ECMA168 logical file / directory structure basic specification about a compact disk.

[Drawing 7] It is the simplified schematic showing the desirable example of the logic file system format for the compact disk which has this invention used together.

[Drawing 8] It is the simplified schematic showing the desirable example of the packet format adopted as increment record of a file in relation to this invention.

[Drawing 9] It is the simplified schematic showing the desirable example of the packet format adopted as a file and increment record of directory information in relation to this invention.

[Drawing 10] It is the simplified schematic showing the desirable example of the file / directory record format adopted as a file and increment record of directory information in relation to this invention.

[Drawing 11] It is the simplified schematic showing the desirable format of the SCSI write-in command used together with this invention.

[Drawing 12] It is a flow chart the first half in which a desirable operation of this invention is shown.

[Drawing 13] It is a flow chart the second half in which a desirable operation of this invention is shown.

[Drawing 14] It is the flow chart which shows the desirable example of the procedure which writes a packet in a compact disk recorder in the desirable file system example of this invention.

[Drawing 15] It is the flow chart which shows the 2nd desirable example of the procedure which writes a data packet in a compact disk recorder in the desirable file system example of this invention.

[Description of Notations]

10 -- Computer

15 -- Compact disk recorder

20 -- Compact disk

25 -- Scanner

30 -- Memory

35 -- Hard disk

40 -- Compact disk prayer

45 -- Compact disk
